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Earle P. Jones, Jr.

sil.vics \ 'sil-viks \ *n pl but sing in constr* [NL *silva*] : the study of the life history, characteristics, and ecology of forest trees esp. in stands
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MECHANICAL SITE PREPARATION IMPROVES GROWTH OF
GENETICALLY IMPROVED AND UNIMPROVED SLASH
PINE ON A FLORIDA FLATWOODS SITE ^{1/}

Kenneth W. Outcalt ^{2/}

Abstract.-- In 1971 genetically improved and unimproved slash pine (*Pinus elliottii* Engelm.) seedlings were planted on north Florida flatwoods sites prepared by four different methods: no treatment (control), prescribed burn, burn + double disk, and burn + double disk + bed. Ten years after planting, survival of seedlings established under all treatment conditions was equally good, averaging almost 90 percent. There were no differences in diameter, height, or volume between control and burn-only plots. Disking significantly increased average tree diameter and height. Volume production was 60 percent greater on the disked than on control or burn plots. Bedding after diskling was no better than diskling alone. Genetically improved stocks yielded about 40 percent more wood than unimproved stock at age 10.

Intensive site preparation has become a standard practice for establishment of pine plantations on most sites in the Atlantic and Gulf Coastal Plains. Past work has shown that mechanical site preparation, such as diskling and/or bedding, can increase initial survival and growth of planted pines (Derr and Mann 1970, Lennartz and McMinn 1973). The relative effectiveness of various methods, however, depends on site characteristics (Derr and Mann 1977). The study described here was established to compare the effects of different site preparation methods on survival and growth of slash pine on a north Florida flatwoods site. A secondary purpose of the study was to compare the response of genetically improved with unimproved slash pine seedlings when planted on areas prepared by different methods. Reported here are the results at plantation age 10 years.

METHODS

The study area of about 8 acres is on the Olustee Experimental Forest in Baker County, Florida. The soil is a poorly drained Leon fine sand (Aeric Haplaquod) with a spodic horizon at a depth of 12 to 18 inches. The water table is at or near the surface during portions of the year (Schultz 1976) and mottling occurs in the profile at 15 to 21 inches.

Twenty-four plots, each 70 by 100 feet, were established in a randomized block design with 3 blocks, 4 methods of site preparation, and 2 types of planting stock. The site preparations were: no treatment; prescribed burn; burn and double disk; and burn, double disk, and bed. Planting stock was of two types: unimproved and genetically improved, a mixture of 10 superior families. Types of stock were included in factorial combinations with the different methods of site preparation.

In 1968 a sparse stand of 60-year-old longleaf pine (*Pinus palustris* Mill.) was harvested from the site. Sites were prepared in the spring of 1970. The prescribed burns (backfires) consumed most of the vegetation, leaving only woody stems of shrubs standing. A heavy-duty offset harrow was used for diskling. Beds about 6 inches high and 10 feet apart were formed with a bedding harrow and water-filled rolling hourglass packer.

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Improved seed was collected from select crosses in the Olustee Experimental Forest clone bank. The Florida Division of Forestry furnished unimproved seed and grew all the seedlings at its Chiefland nursery. In February 1971, 1-0 seedlings were lifted and planted on the study site. One hundred trees were hand-planted in each of the 24 plots. Spacing was 7 feet within rows with rows 10 feet apart. A 4-row isolation strip planted to unimproved seedlings was established around each plot.

RESULTS

Site preparation had no significant effect on survival, with all treatments having good survival at 10 years of age (table 1). Burning improved neither survival nor growth of trees. Mechanical site preparation, however, increased growth of both improved and unimproved stock. Disking increased average tree diameter by 0.5 inches, average height by 3.8 feet, and volume production by over 200 feet³/acre (0.25 cds/acre/year) above control trees. Trees on disked and bedded plots were not significantly larger than those on disked-only plots.

Table 1.—Survival, growth, and yield of slash pine, by type of seedling and method of site preparation 10 years after planting.

Seedling type and site preparation	Survival	Average diameter	Average height	Volume ^{1/}
	(percent)	(inches)	(feet)	(ft ³ /acre)
Unimproved seedlings				
Control	83	3.3	20.4	280
Burn	87	3.0	18.4	240
Burn + disk	91	3.6	22.6	405
Burn + disk + bed	90	4.1	25.6	575
Average	88	3.5	21.8	375
Improved seedlings				
Control	82	3.5	22.4	345
Burn	83	3.5	22.3	360
Burn + disk	91	4.3	27.7	680
Burn + disk + bed	90	4.4	28.3	705
Average	87	3.9	25.2	523
All seedlings				
Control	83 a ^{2/}	3.4 a	21.4 a	315 a
Burn	85 a	3.3 a	20.3 a	300 a
Burn + disk	91 a	3.9 a	25.2 b	545 b
Burn + disk + bed	90 a	4.2 b	27.0 b	640 b

^{1/}Total inside bark volumes based on equation of Schmitt and Bower (1970).

^{2/}Values within a column not followed by the same letter are significantly different at the .05 level.

Improved and unimproved seedlings had equally good survival at age 10, but improved trees grew faster than unimproved ones. After 10 growing seasons improved trees were an average of 0.44 inches larger in diameter and 3.4 feet taller and had produced 40 percent more wood. The overall interaction between site preparation and planting stock was not statistically significant, but it appears that bedding after diskling was beneficial for growth of the unimproved, but not the improved seedlings.

DISCUSSION

The similarity in growth between trees on the control and the burned plots was due, at least in part, to the 1-year delay between site preparation and planting. A contributing factor was the greater amount of understory vegetation, especially saw palmetto (*Serenoa repens* [Bartr.] Small) on burn plots prior to treatment (Schultz 1976). Although the burn reduced competition, by planting time the burned plots had as much or more competition than the control plots.

A major justification for bedding flatwoods sites is to increase seedling survival by reducing prolonged saturation of the root zone (Schultz 1976). However, not all sites are wet enough to benefit from this treatment. On some sites diskling is as effective as bedding for increasing growth of planted slash pine (Derr and Mann 1977, Cain 1978). The reason for the lack of response on some sites may not be completely understood, but what sites it will occur on has become more predictable. Bedding sites with Spodosols without an argillic horizon, like the soil in this study, has not improved site productivity (Broerman and Sarigumba 1981). On these soils competition control is the major benefit of site preparation, and diskling or harrowing accomplishes this quite well. Bedding after diskling on these soils will not likely pay off and can even cause some negative effects. Thus, bedding like most silvicultural practices needs to be prescribed by site.

Since there was no interaction between site preparation and type of planting stock, their effects are assumed to be additive. Diskling should increase volume production at age 10 by about 230 cubic feet per acre over untreated sites no matter what type of planting stock is used. The gain from using the improved stock should be about 150 cubic feet per acre. With improved stock planted on disked sites, volume at age 10 should average about 660 cubic feet per acre, or about double the yield from untreated sites planted with unimproved stock.

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